MARINE ENGINEERING

Die Schiffsmaschine: ihre Construction, Wirkungsweise und Bedienung. Bearbeitet von Carl Busley, &c. (Kiel, 1883.)

THIS is designed to be a manual and book of reference on marine engineering, for the use of engineers, naval officers, students, and others interested in steamships. The author is a marine engineer in the Imperial German service, and a professor at the Naval Academy of Kiel. He has laid down a most comprehensive scheme for the work, and the first and second divisions already published contain good evidence that the book when completed will become the standard German work on the subject.

Marine engineering has made great strides in recent years, and is now much more largely regulated by scientific methods than it was formerly. The earlier text-books have become obsolete to a great extent, and a demand has arisen for new works in which modern principles and practice should be represented. In response to this demand two or three excellent books have recently been published in this country; and Mr. Busley has determined to do a similar service for Germany. It is but right to say that his book will bear very favourable comparison with any book of the class yet published, and it surpasses all of them in the fulness and beauty of the illustrations, which are contained in separate atlases and printed in colours, on a scale which makes many of them virtually working drawings.

Theoretical investigation and practical information on the details of the construction and management of marine engines and boilers both find a place in this book. Its arrangement is admirable. First, there is a clear and succinct description of the principles of the mechanical theory of heat, followed by a discussion of the properties of steam. Next comes a chapter on combustion, including a summary of the conditions essential to good boilers, and a statement of the steam-producing powers of various kinds of coal. If there is not much novelty in this section of the book, it is full of useful information. In the fourth chapter there is a long discussion of the various matters affecting the performance and economy of marine engines; details as to coal-consumption in various types of engines, with methods for estimating the expenditure of steam and coal in ships of new design; definitions of horse-power, nominal, effective, and indicated; together with remarks on various systems of condensing steam, &c.

Following these introductory chapters, three others are devoted to marine boilers, their construction and management, including the best means of preserving them. These chapters are chiefly of a practical character, and will repay careful study, as they contain a most valuable summary of information and good rules for guidance. The eighth chapter is also of a practical nature, containing detailed examples of the auxiliary engines used for a vast variety of purposes in steamships. Amongst these may be mentioned the turret-turning and air-compressing engines of modern war-ships; steam-steering engines of various types; engines employed for heaving-up anchors and cables; others used in the production of the electric lights now generally carried by war-ships or large passenger steamers; pumping engines; steam-winches; ventilating machinery; appliances for condensing fresh water, &c. All of these and many others are described and illustrated in a manner which makes this portion of the book most valuable for reference. No similar summary of information on these important, if subordinate, portions in the equipment of a steamship has been previously published; and Mr. Busley deserves great credit for his perception of the necessity for and value of the information herein collected.

The ninth, tenth, and eleventh chapters relate to the construction and theory of the various types of marine engines which are or have been in use. Full descriptions and drawings are given of different systems—including some which are, as yet, only in the experimental stage; screw-steamers, paddle-steamers, and vessels driven by water-jets all come under review; and very valuable tables are given of the dimensions and particulars of the machinery in a large number of German, English, and French ships. Mr. Busley throughout displays a cosmopolitan spirit in his massing of facts, and this makes his book all the more valuable. The theoretical investigations include rules for estimating the engine-power required to attain the assigned speed of a ship; examples of the analysis of indicator diagrams for simple and compound engines; graphic processes for dealing with the slide-valves; and detailed investigations or descriptions of slide-valve gear, steering gear, &c.

This completes the contents of the first half of this book; the other half has yet to be published, we believe. If it maintains the high character of the part already given to the world, the book will be certain to achieve success. It has been produced in excellent style, both as regards letterpress and illustrations. Its chief value consists no doubt in the large amount of information respecting modern practice which has been brought together; but the treatment of the scientific branches of the subject will assist to secure its favourable reception by the classes of readers for whom it is especially designed.

OUR BOOK SHELF

Guide to the Calcutta Zoological Gardens. By John Anderson, M.D., F.R.S., Honorary Secretary and Treasurer. (Printed by order of the Honorary Committee of Management, Calcutta, 1883.)

ALTHOUGH the meritorious idea of starting a zoological garden at Calcutta was put forward by the well-known naturalist MacClelland as long ago as 1842, and several attempts were subsequently made to carry out the plan, it was not until 1875, chiefly, we believe, owing to the exertions of the late Mr. Schwendler, the telegraph engineer, that an appropriate site was obtained, and the present gardens were founded. After eight years of development the Zoological Gardens of Calcutta, under the energetic rule of the present Honorary Director, have attained a degree of arrangement sufficiently stable to allow of a "Guide" being prepared. Dr. Anderson's able pen has accordingly been employed in describing the institution which he has so well organised.

For a "Guide" Dr. Anderson's volume is perhaps rather bulky, and the type employed unnecessarily large. It is also, we may add, in our opinion a little too learned for a popular handbook. But the information contained in it, compiled as it is by one of the leading zoologists of India, may be generally depended upon, and so much can scarcely be said for some similar publications. At

the same time we may remind Dr. Anderson that the statement that the sternum in *all* Picarian birds has a "double notch behind" (p. 94) is not quite correct, and that he has overrated the number of African rhinoceroses.

Judging from the "Guide," the series of animals now exhibited in the Zoological Gardens of Calcutta must be considerable, although no actual statistics are furnished to us on the subject. Several animals of special rarity are mentioned as in the collection, such as a specimen of Grant's Gazelle (*Gazelle granti*) from East Africa, and the *second* known example of the Hairy-eared Rhinoceros of Chittagong. It is also of great importance to learn that the phenomenon of incubation of one of the large Pythons has been witnessed in Calcutta as well as in European Gardens. On the whole, the naturalist will find many things to interest him throughout the present volume, though, as already said, some of the disquisitions are not perhaps quite suitable to a popular work.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Earthquakes and Air-Waves

IN the *Comptes Rendus* of the French Academy of Sciences for February 18, 1884, there appears a communication from Prof. Förster of Berlin relative to a statement previously made in the *Comptes Rendus*, to the effect that it was from observations taken at Berlin that he had arrived at certain conclusions as to the propagation of the atmospheric disturbance caused by the last great explosion in the eruption of Krakatoa in August last.

Prof. Förster explains that the statement referred to was a mistake, and that he had in fact only reproduced, after verifying them by reference to the Berlin observations, the conclusions come to by me, as explained in a paper read before the Royal Society on December 17, 1883, the principal part of which was published in NATURE of December 20 last (p. 181).

He adds that in his original note on the subject he had not mentioned my name as the author of the conclusions referred to, in consequence of the manner in which I had spoken of them myself.

Prof. Förster, while putting himself right on this point, has interpreted my own intention with great sagacity. For the light I may have been able to throw on the facts was in truth consequent on information put before me by the intelligent officers of our Meteorological Office, aided by a suggestion from Prof. Stokes, who like myself is a member of the Meteorological Council.

Such credit, however, as is due for bringing to notice the curious phenomenon in question may be fairly claimed for our Meteorological Office, as there is little reason to doubt that it would have remained unnoticed had it not been for the comparison of the several records of the continuously self-registering instruments which the organisation provided from the public grant we receive has placed at our command, and which no individual effort could have supplied.

February 26 RICHARD STRACHEY

IN the Jamaica Weather Report, No. 35, for November last year, I was unable to explain how it was that the Krakatoa air-wave had affected our barometer so strongly: the explanation is that Jamaica is very near the antipodes of Krakatoa (NATURE, vol. xxix. p. 181).

The general effect of the disturbance at Jamaica was to produce a barometric depression, preceded and followed by small barometric elevations, according to the following table, which gives for local time the pressure of the atmosphere at the sea-level, expressed in inches of mercury at 32°, and corrected for diurnal variation:—

Kingston, Jamaica, 1883

		in.
August 26,	3 p.m.	29·972
26,	11 p.m.	·975
27,	7 a.m.	·982
27,	3 p.m.	·944
27,	11 p.m.	·983
28,	7 a.m.	·994
28,	3 p.m.	29·975

Now the impulse at Krakatoa occurred at 9.24 a.m. local time, and it reached Jamaica about 3 p.m. local time, or eighteen hours afterwards; consequently the average velocity of the wave was about 690 miles an hour—which is wholly in accordance with the velocity deduced by General Strachey from places in Europe and elsewhere.

But there was no great explosion at Krakatoa at 9.24 a.m., and it seems possible that this great air-wave was similar to the air-waves we always experience in Jamaica whenever there is a shock in Kingston sufficiently strong to be distinctly felt.

In August 1881 I published a Report on Earthquakes in Jamaica, No. 4, in order to call attention to the following facts:—

1. The atmospheric pressure oscillates for some hours before and after a shock, the lowest depression generally occurring at the time of the shock.

2. The wind generally lulls, so that "the weather" is hot and oppressive.

3. Clouds (stratus) gather over the sky after the shock.

4. The temperature of the air, if we allow for the cooling effect of (3), remains unchanged.

5. The rainfall is unaffected.

These facts have been fully confirmed by subsequent shocks. As an example let us consider the last shock which occurred on January 14 this year, and which was felt over nearly the whole of the island.

At Kingston it was felt as a sharp double-shock at 1.15 p.m.; the first shock lasted about three seconds, then there was an interval of about two seconds, which was followed by the second shock, lasting about five seconds. There was a strong sea-breeze blowing during the day, but a temporary lull occurred just before the earthquake.

The following table gives the pressure of the atmosphere at the sea-level, expressed in inches of mercury at 32°, and corrected for diurnal variation:—

Kingston, January 14, 1884

	in.
24 hours before the shock	30·061
16 ,, ,, ...	·047
8 ,, ,, ...	·043
At the time of the shock	·016
8 hours after	·024
16 ,, ...	·063
24 ,, ...	30·056

On January 13 the average amount of cloud was 7 per cent. of the whole sky, on the 14th it was 10, and on the 15th it was 43!

Further particulars will be found in the Jamaica Weather Report, No. 37, for January 1884, and it will here be sufficient to remark that the depression at the time of the shock was quite as strongly marked at the cinchona plantation, thirteen miles from Kingston, but 4850 feet above the sea-level.

It is needless to say that I am at a loss to account for the connection which most undoubtedly exists in Jamaica between earthquakes and air-waves; but it is evident that the latter may be connected with the former without any, the slightest, approach to volcanic explosion; and the Krakatoa air-wave was probably similar in all respects, except magnitude, to the waves we continually experience in Jamaica at the time of earthquake shocks.

Jamaica, February 7 MAXWELL HALL

The Remarkable Sunsets

AT 8.45 a.m. to-day the sun seen from here through a light mist was of a slightly metallic and very pale sea-green colour. The mist was not dense enough to render objects at a distance of twelve yards indistinct, but beyond that distance they rapidly became invisible. There was no wind, and the mist seemed free from smoke. I could form no opinion as to its height. Half